Revisiting the recommended duration of interviews conducted by mobile phone in low- and middle-income countries: a randomized trial in Malawi

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Abstract

Guidelines for the conduct of surveys by mobile phone calls in low- and middle-income countries suggest keeping interviews short (<20 minutes). The evidence supporting this recommendation is scant, even though limiting interview duration might reduce the amount of data generated by such surveys. We recruited nearly 2,500 mobile phone users in Malawi and randomly allocated them to 10-, 20- or 30-minute phone interviews, all ending with questions on parental survival. Cooperation was high in all groups, and differences in completion rates were minimal. The extent of item non-response, age heaping and temporal displacement of deaths in data on parental survival generally did not vary between study groups, but reports of maternal age at death were more reliable in longer interviews. Recommendations about the duration of mobile phone interviews might be too restrictive. They should not preclude additional modules, including ones on mortality, in mobile phone surveys conducted in LMICs.

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INTRODUCTION

Surveys are key tools for monitoring demographic and health trends in low- and middle-income countries (LMICs) (Thacker & Berkelman, 1988). In such settings, participants are typically recruited during household visits and asked to complete an in-person interview. This process is however costly and time-consuming, and thus cannot be repeated frequently. At times, it is unfeasible, like during health crises and conflicts (Etang & Himelein, 2020).

Survey participants might also be recruited and interviewed by phone. In high-income countries, surveys and polls have long targeted landline (also called "fixed-line") users, but in LMICs, few households have access to a landline. For example, in Nigeria – the largest LMIC in Africa – fewer than 1% of households had access to a landline in 2018. By comparison, close to 90% of households in Nigeria had access to at least one mobile phone (National Population Commission & ICF, 2019). As access to mobile phones continues to expand in LMICs (ITU, 2021), mobile phone surveys (MPS) – surveys where participants are contacted and interviewed entirely by mobile phone calls (Gibson et al., 2017) – are becoming an increasingly popular mode of data collection.

MPS require less complicated logistics than in-person surveys and can be repeated more often. Because they are implemented remotely, MPS can also be sustained in situations where travel and contacts required by household surveys might carry risks for interviewers and participants, such as disasters, conflicts, or epidemics (Etang & Himelein, 2020; Hoogeveen et al., 2014; Jones, 2018). As examples, several MPS were launched during the Ebola epidemic in West Africa (Kuehne et al., 2016) and during lockdowns and other periods of restricted mobility precipitated by the COVID-19 pandemic (e.g., Phadnis et al., 2021; World Bank 2021). MPS have also been conducted in conflict zones, as in Northern Cameroon (Gignoux et al., 2020) and Mali (Lendorfer et al., 2016).

The growing interest in MPS has generated several sets of guidelines about how to implement such surveys in LMICs (Angrist et al., 2020; Dabalen et al., 2016; Dillon, 2012). One typical recommendation is to keep interviews conducted by mobile phone short. The Multiple Indicator Cluster Surveys (2021) thus recommends limiting the duration of calls to 10-15 minutes. Glazerman et al. (2020) and Zezza et al. (2021) suggest that MPS should last less than 20 minutes to avoid fatigue. Similarly, von Engelhardt and Jones (2020) advise limiting MPS to 15-20 minutes, especially if respondents have been affected by disasters and traumatic events.

Keeping interviews short reduces the amount and scope of data generated by MPS. Under this recommendation, MPS typically restrict the number of questions or exclude entire themes that are traditionally covered in household surveys. The evidence for keeping MPS interviews below 20 minutes is however scant, drawing on personal experience, informal feedback obtained from MPS interviewers, and studies conducted in high-income countries that have included primarily landline users (e.g., Hansen, 2007; Roberts et al., 2010).

In LMICs, investigations of the impact of interview duration on data quality have focused on in-person surveys. In such inquiries, longer questionnaires did not always reduce participation in data collection (Bray et al., 2021) or generate lower-quality data (Allen et al., 2020). In a study in western Kenya, increased respondent fatigue associated with interview duration did not affect data reliability (Laajaj & Macours, 2019). In a recent experiment in Ghana, however, respondent fatigue affected the quality of data on labor activities (Ambler et al., 2021). Only two recent studies have investigated the impact of the length of MPS interviews in LMICs. These studies conducted in Ethiopia found that delaying questions on nutrition until later in phone interviews led to an underestimation of household consumption (Abate et al., 2023) or reduced the reliability of nutrition scores (Abay et al., 2022). Neither investigation though examined the impact of interview duration on data on topics other than nutrition, or on MPS participation and completion rates.

We present the results of an experiment conducted in Malawi, a low-income country in southeastern Africa where mobile phone service is available in more than 95% of enumeration areas (Afrobarometer, 2022). We randomly allocated nearly 2,500 mobile phone users to interviews of varying duration (10-, 20- and 30-minutes). In this experiment, we placed a similar set of questions about mortality towards the end of each questionnaire. We focused on mortality because it is a core topic in many household surveys and censuses (Hill et al., 2018; Timaeus & Jasseh, 2004), and the routine collection of mortality data is essential to monitor population health (Mikkelsen et al., 2015). Yet, mortality-related modules have been left out of most MPS recently conducted in LMICs.

Some of the concerns explaining the omission of mortality-related questions in most recent MPS have already been dispelled. In particular, worries that questions about deaths might be too sensitive to ask on the phone seem unfounded. MPS conducted in India and Bangladesh during the COVID-19 pandemic have asked mobile subscribers to report recent deaths in their households, without experiencing significant declines in cooperation (Barnwal et al., 2021; Jha et al., 2022). A recent randomized trial in Malawi has also assigned mobile subscribers to an interview about either deaths having recently occurred in their family, or about their economic activity (Chasukwa et al., 2022), i.e., a topic often investigated by MPS in LMICs (Egger et al., 2021). It found similar levels of cooperation and interview completion in both groups. Furthermore, mortality-related questions did not trigger strong emotional reactions among respondents at a higher rate than questions related to economic activity.

The remaining concerns about including mortality-related modules in MPS now stem, in large part, from worries that adding such questions will lead to interviews that exceed recommended duration guidelines (Wolf et al., 2016). This might lead to a deterioration of cooperation and completion rates, if potential participants refuse to participate in interviews with longer stated durations and/or fail to complete the interview due to fatigue. It might also affect the quality of data generated by

an MPS. As interviews conducted by mobile phone become lengthier, respondents might rush through their answers so that they can resume their usual activities more quickly. They might spend less time retrieving information (either in their memory or in documents) needed to answer some of the questions (Helleringer et al., 2014; Pullum et al., 2013). Finally, interviewers might also be less inclined to probe or cross-check answers in longer interviews, so that they can meet their daily interviewing targets and/or limit the duration of their workday.

In this experiment, we assessed the validity of these concerns about the inclusion in MPS of additional questions pertaining to mortality. We tested two hypotheses deriving from these concerns. First, based on current recommendations about the length of MPS, we hypothesised that cooperation and completion rates should decline with interview duration, particularly when exceeding the 20-minute mark. Second, we also expected that key indicators of data quality (e.g., item non-response) would be worse in study groups assigned to longer interviews.

DATA

In April-June 2022, we recruited mobile phone users aged 18–64 years old through random digit dialing (L'Engle et al., 2018). After a short introduction, we screened mobile users for eligibility. Besides age, eligibility criteria also included residence in Malawi, and the ability to hold a conversation in one of the main languages spoken in the country (i.e., Chichewa or Chitumbuka). To ensure sufficient representation of groups that are typically harder to reach by mobile phone in LMICs (Nagpal et al., 2021), we implemented sampling quotas for age, gender and region of residence. Eligible users whose quota had not yet been filled were randomized to interviews with stated durations of either 10-, 20- or 30-minutes. Interviewers then sought oral consent from the mobile phone user. Interviewers remained unaware of the mobile user's assigned interview duration until that stage in the recruitment and consent process. The script used to elicit consent specified the expected duration of the MPS interview, as well as the fact that the interview would include questions about recent deaths among the respondent's relatives. In each study group, as is

common practice in MPS (Glazerman et al., 2020), participants who completed the interview were transferred mobile phone pre-paid units, as a token of appreciation. The amount of these units was set at 1,200 Malawian Kwacha (approximately 1.4 US dollars at study time), regardless of the length of the interview.

Questionnaires in all study groups covered respondents' socio–economic background, economic activity, knowledge and attitudes related to Covid-19, and respondents' reactions to the interview (Table B1, Appendix B). They also included a module on parental survival, placed near the end of the questionnaire.[1] This module has been included in prior large-scale household surveys in LMICs (Hirschman et al., 1995; Saikia et al., 2019). It asks respondents about their mothers' and fathers' vital status, with follow-up questions about the current age and residence of living parents, and about the age at death and year of death of deceased parents. These data allow estimating mortality rates at adult and older ages. If the parent died between 2019-2022, we also asked about the month of death and whether the death had been registered with Malawi's National Registration Bureau (NRB), i.e., the administrative office implementing civil registration.

Finally, we collected paradata about the interview process, including time stamps for the start and end of the interview, as well as for each question asked during the interview (Kreuter, 2013). Appendix A provides additional information on the trial design.

METHODS

The primary outcome of this trial was the cooperation rate, i.e., the proportion of mobile users who were interviewed among eligible mobile users. In our study, eligible mobile users who were over quota were not allocated to a study group and were not offered the opportunity to cooperate. We thus use a definition of the cooperation rate, labelled as *COOP1* in the guidelines of the

[1] Similar modules have been used elsewhere in LMICS to estimate adult mortality (e.g., Hirschman et al., 1995).

American Association for Public Opinion Research (AAPOR, 2023, p. 87). It is defined as:

$$\frac{\text{Completed interviews}}{\text{Completed interviews} + \text{partial interviews} + \text{refusals and breakoffs} + \text{other}}$$

In our trial, interviews are considered "partial" when the mobile user consented to participate but did not reach the final section of the survey on feelings experienced during the interview (i.e., the last set of questions in all study groups). "Refusals and break-offs" are instances when mobile users did not consent to participate. "Other" includes situations where mobile users consented to participate, but indicated that they would prefer to be called back at a later time to complete the interview. In a few of these instances, study interviewers never managed to reach such mobile users again. As a secondary outcome, we also examined the completion rate, defined as the number of completed interviews divided by the sum of completed and partial interviews only (Leo et al., 2015).

We investigated the effects of interview duration on data quality separately for questions related to parental survival, and for other questions included in all three survey questionnaires (Table B1, Appendix B). For non-mortality-related questions, we measured the extent of item-nonresponse in each study group. Item non-response refers to instances where the information requested by a question is not provided. It often emerges as a result of respondents stating that they "don't know" an answer, or refusing to answer a question. It can also be induced by interviewers if, for example, they fail to ask the question, potentially in a deliberate attempt to reduce workload and skip long batteries of questions (Fowler & Floyd, 2004). For mortality-related questions, to assess item non-response, we computed the proportion of fathers/mothers with missing data on vital status, current age for living parents, and age and year of death for deceased parents. For mothers/fathers who died between 2019 and 2022, we also examined the extent of non-response on the month of death and the registration status of the death.

In addition, we investigated age heaping and displacement of deaths in parental survival reports. Heaping occurs in data on ages when there is an excess of reports ending in specific digits, usually 0 and 5 (Spoorenberg & Dutreuilh, 2007). It is a strong signal of the presence of systematic errors and inaccuracies in age data (Rosenzweig, 2021). We measured heaping in the reported ages of living and deceased parents using (i) Whipple's Index and (ii) a modified Whipple's Index proposed by Randall and Coast (2016) for older populations (hereafter Whipple60). Whipple's Index is calculated as:

$$5 * \frac{\sum (\text{persons aged } 23-62 \text{ years (inclusive) whose ages end in 0 or 5})}{\sum (\text{population aged } 23-62 \text{ years old})}$$

The result varies between 100 (no preference for digits 0 or 5) and 500 (complete report on ages ending by 0 or 5). Whipple60 is calculated by summing individuals aged 60 and older whose ages were reported as ending in 0 or 5 and dividing that sum by the total population above 60.

Deaths might also be displaced in time in reported survey data (Helleringer et al., 2020), especially if follow-up questions apply only to a subset of deaths that have occurred in a recent period, as was the case in our study. Respondents and especially interviewers might be tempted to shift a reported death to an earlier time period, so that they do not have to ask or answer additional questions. We investigated potential displacements in recent parental deaths by estimating the percentage of deaths of mothers/fathers that occurred in the 2019–2022 period out of the total number of reported deaths of mothers/fathers.

We tested for differences in cooperation, completion, item non-response and displacement between the study groups using Chi-square tests. To assess differences in age heaping between the study groups, we used bootstrapping methods. We repeatedly drew 1,000 samples with replacement from our survey data and obtained pseudo-confidence intervals using the 2.5th and 97.5th percentile of the 1,000 bootstrap estimates.

Finally, using paradata collected about each interview, we examined the time required to complete the module on parental survival in each of the three study groups, and we assessed whether it differed by the vital status of the parent. We used this information to explore whether interviewers and respondents might increasingly "rush" through the section on parental survival, if it is asked several minutes later in the course of the interview. All analyses were conducted as pre-specified intent-to-treat analyses (Appendix A for details).

RESULTS

Enrolment and participant characteristics

Interviewers dialed more than 9,000 mobile phone numbers (Fig. B1, Appendix B), reaching 3,853 mobile users. Of these, about 10.5% (n=367) indicated no interest in the study. Among mobile users screened for eligibility (n=3,476), 53 did not meet the age-related inclusion criterion, 27 did not report their age or gender, and 3 were excluded because of other reasons (e.g., the number reached was a company number, or they did not speak one of the study languages). The sampling quotas of 907 other mobile users had already been filled. The final sample consisted of 2,486 mobile users who were randomized to one of the three study groups. Overall, 43% of the sample was younger than 30 years and 48% was between 30–49 years old. The majority of participants resided in urban areas and in Southern Malawi (Table B2, Appendix B). There were no meaningful differences in background characteristics between study groups, suggesting that the randomization achieved the desired balance.

Survey participation

Table 1 reports the study's primary and secondary outcomes, by assigned group. The cooperation rate was 96.2% (805/837)[2] in the 10-minute group vs. 94.7% and 94.0% in the 20- and 30-minute surveys, respectively (p=0.07). We found no heterogeneity in the effects of stated interview length

[2] See Table B3 in Appendix B for detailed count distributions.

on cooperation rates in sub-group analyses by gender, age, residence type and region. In the 10-minute group, the completion rate was 99.1% vs. 98.0% in the 20-minute group and 97.3% in the 30-minute group. While statistically significant (p=0.02), these differences do not appear to be practically meaningful.

Table 1. Primary outcomes, by stated interview duration

	10 min survey	*20 min survey*	*30 min survey*	*Total*
Cooperation rate	96.2%	94.7%	94.0%	95.0%
Completion rate	99.1%	98.0%	97.3%	98.1%

Data quality

Participants were asked questions about their mother's survival about 10 minutes and 20 sec (inter-quartile range (IQR)=6.50–10.51) after consenting to participate in the 10-minute interview, 14 minutes (IQR=10.40–16.33) into the 20-minute interview and 18 minutes (IQR=13.41–20.47) into the 30-minute interview (Fig. B2, Appendix B).

Overall, 0.3% and 1.2% of the respondents reported being unaware of the vital status of their mother and father, respectively (Fig. B3, Appendix B). Data on current age was missing for 5.1% of living mothers (88 out of 1,727 reports) and 7.8% of living fathers (95 out of 1,211 reports). The likelihood of missing data on current age of surviving parents was not related to the stated questionnaire duration (Fig. 1, p=0.72 for mothers, p=0.71 for fathers).

Information on age at death was missing for about a quarter of deceased mothers. Non-response on that item was more likely in shorter surveys, i.e., 10- and 20-minute interviews (Fig. 1, Panel A). Age at death was missing for 28.7% of deceased fathers (i.e., in 322 out of 1,121 reports), with no difference by study group (Panel B). Data on the year of death was missing for 5.0% (n=31) of mothers' deaths vs. 7.8% (n=63) of fathers' deaths. Non-response on the year of death was not

related to the stated interview duration (p=0.12 for mothers; p=0.60 for fathers).

Among recent parental deaths (i.e., those that happened between 2019–2022), 10% of mothers' recent deaths had missing information on registration status (Fig. 1, Panel A). The corresponding figure for recent paternal deaths was 20% (Panel B). We found no differences in the level of non-response on the item pertaining to civil registration status by survey duration (p=0.52 for mothers; p=0.53 for fathers).

We also compared the extent of item non-response on non-mortality questions. We found very low levels of item non-response in general, and in particular no significant between-survey differences for questions that were asked in all three questionnaires. Item non-response was minimal for questions appearing later into the interviews such as ones related to knowledge of COVID-19 symptoms, mask use and testing (Table B4).

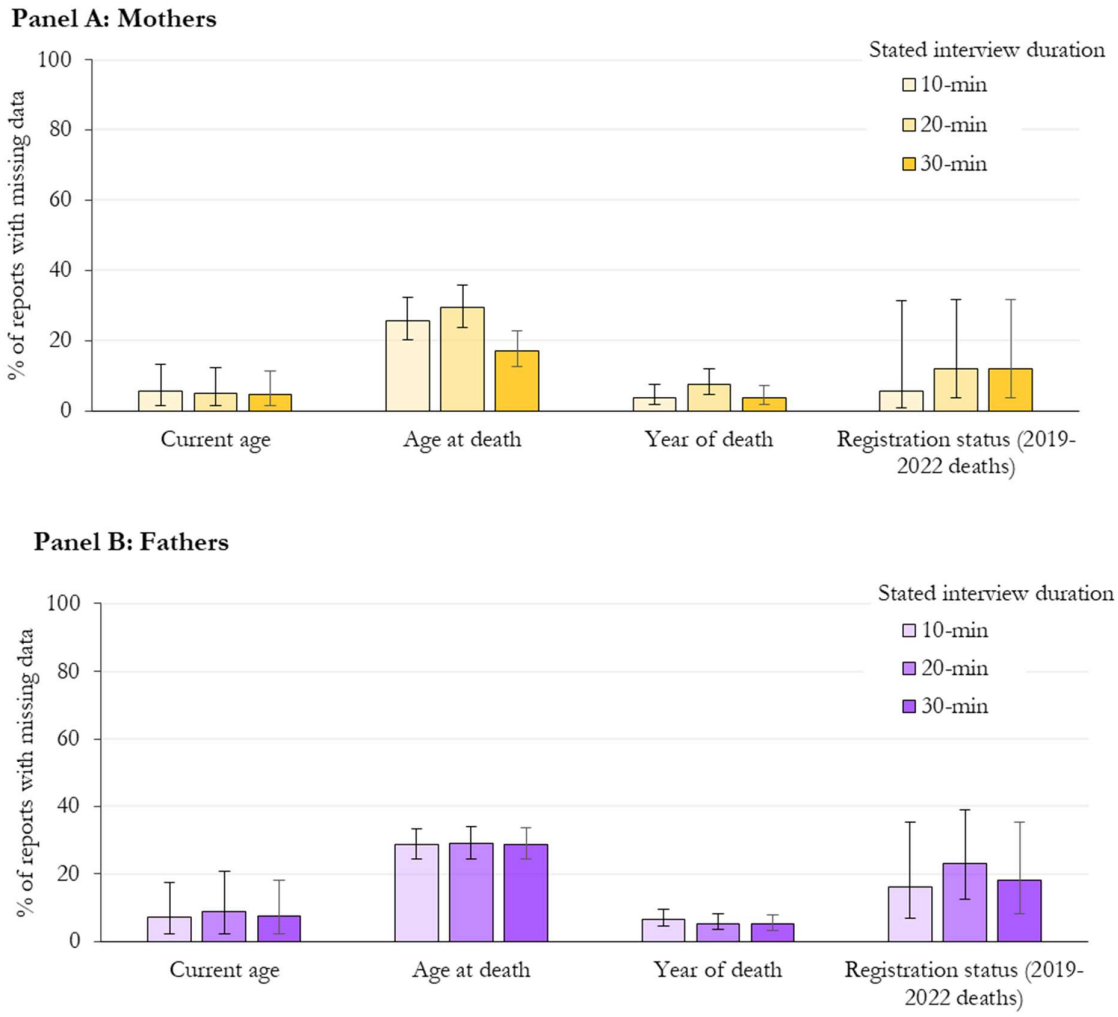
Age heaping was prevalent among reports that pertained both to living and deceased parents, with measures of Whipple's index often indicating rough or very rough age data. There were however no systematic differences in Whipple's Index by stated interview duration (Fig. 2).[3] Whipple60 was lower among fathers in the 30-minute interview group than in the other two study groups. Among mothers, Whipple60 was particularly high in the 10-minute group (p=0.03). In Fig. 3, we show the results of our assessment of death displacement in different study groups. We could not reject the null hypothesis that there were no differences between study groups in the share of recently reported deaths at the p=0.05 level.

Mobile phone users took about 1 minute and 25 seconds (IQR=0.48–1.42) to answer parent-related questions (mother and father). This duration was generally unrelated to the length of the survey (Fig. B4), although respondents allocated the 10-minute survey took longer to respond to

[3] Other measures, such as the Myers, Bachi and Noumbissi indices yielded similar results. Tabular information for both Whipple's Indices are in Table B5 (Appendix B).

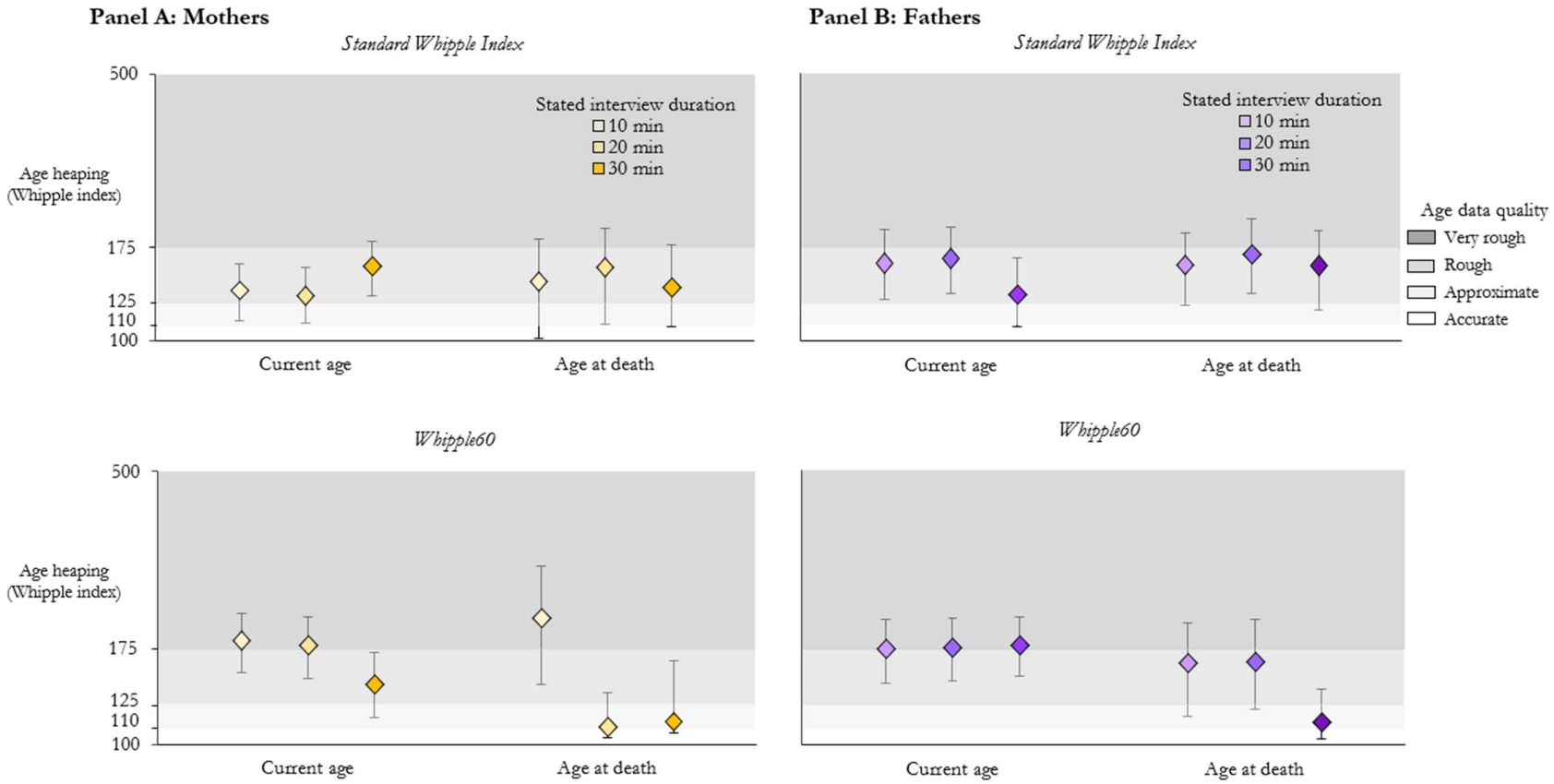
questions about mothers when the parent was alive (Kruskal-Wallis H-test $\chi^2(2)=65.19$, $p<0.001$). Overall, the module required longer time for deceased parents, than for surviving parents.

Figure 1. Item non-response in data on ages, dates and registration status by stated interview duration



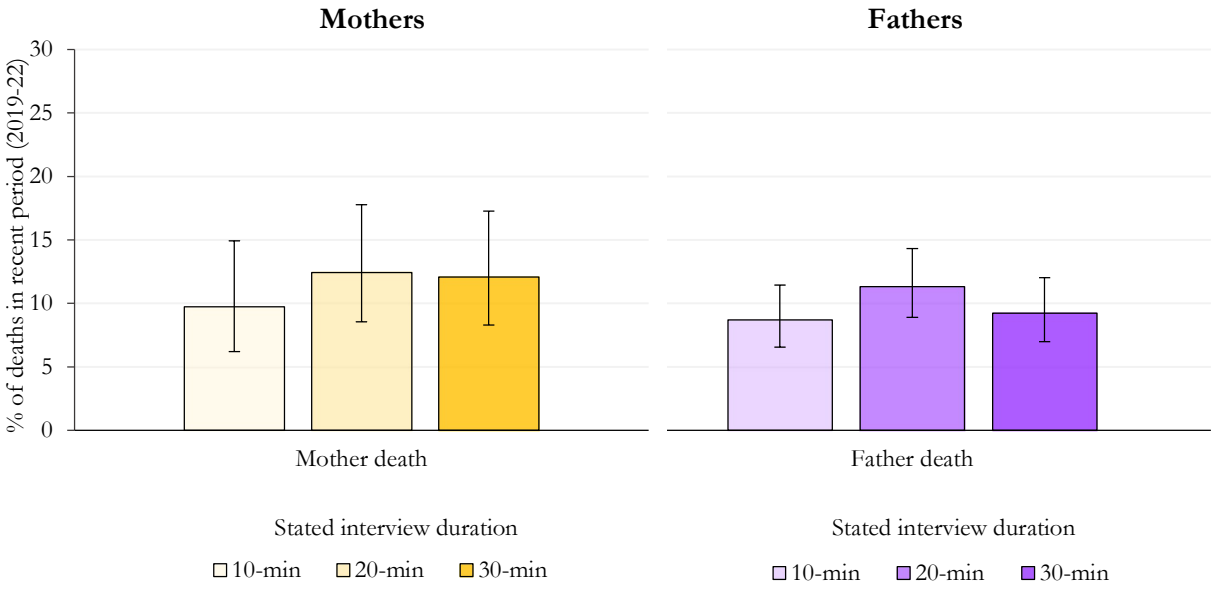
Note: Black bars represent 95% confidence intervals. Current age refers to parents who were reported alive at survey time. Civil registration status concerns only deaths that occurred between 2019-2022.

Figure 2. Age heaping indices



Notes: The standard Whipple Index is calculated for the ages 23–62 (inclusive). The Whipple60 for ages 60+. 95% confidence intervals calculated using bootstrap methods (2.5th and 97.5th percentile). Log-scaled y-axis. The different scales of grey highlight standard cut-offs used to classify age data (United Nations Population Division, 1956).

Figure 3. Share of 2019–2022 parental deaths out of total parental deaths by stated interview duration



Note: Black bars represent 95% confidence intervals.

DISCUSSION AND CONCLUSION

Current guidelines on the implementation of MPS in LMICs suggest limiting interviews conducted by mobile phone to 10-20 minutes to ensure high participation and prevent fatigue among respondents and interviewers. We tested these recommendations with an experiment that relied on a) the randomized assignment of study participants to questionnaires of varying lengths, b) the precise measurement of cooperation and completion rates, and c) a detailed assessment of data quality parameters, in a national sample of mobile phone users in Malawi, a low-income country in southeastern Africa.

In contrast to hypotheses based on existing guidelines, we found high and steady levels of cooperation and completion, even when participants were asked to complete 30-minute interviews, a duration that exceeds current recommendations. The high levels of cooperation and completion observed across study groups in our trial are comparable to those obtained in other MPS conducted around the same time in Malawi (Banda et al., 2021; Chasukwa et al., 2022), and in other African countries and LMICs (e.g., Guzman-Tordecilla et al., 2023; Maffioli, 2020; Phadnis et al., 2021). Although we cannot rule out that these high levels of cooperation and completion are temporary, and might be related to the context of

256 the COVID-19 pandemic (Becker et al., 2022), the results of our trial are promising for enhancing the
257 use and development of MPS in LMICs.

258 We found that increases in questionnaire length beyond recommended limits did not negatively affect
259 the quality of data generated on various topics, including mortality, a core topic of household surveys
260 conducted across LMICs, that has been left out of most recent MPS. For some mortality-related
261 indicators of data quality, data were in fact more reliable in longer interviews. In part, this result may be
262 related to the fewer opportunities available to interviewers to probe/cross-check answers in shorter
263 interviews and/or the content of prior modules. To tease out, these possible explanations, future research
264 could collect paradata specific to the use of probes and investigate cross-module interactions. These
265 findings differ from those of the two studies investigating nutrition and food consumption data generated
266 by MPS (Abate et al., 2023; Abay et al., 2022). These studies suggested that longer interviews reduce data
267 quality in Ethiopia. The discordant results might be because interview modules on
268 nutrition/consumption are often long and repetitive, and place a heavier cognitive burden on
269 respondents than the module on parental survival, which can be as short as 6-10 questions (depending
270 on the parents' vital status, and the date of death). Future studies should assess whether other mortality-
271 related modules – such as birth histories often collected to measure under-5 mortality (Korenromp et al.,
272 2004) – might be more affected by interview duration.

273 Our work has several limitations. First, even though it was conducted among a national sample of mobile
274 users, our experiment was conducted solely in Malawi. It is thus unclear whether our findings might be
275 replicated in settings where time availability and other determinants of participation in MPS might differ.
276 Future work assessing the impact of interview duration on MPS participation and data quality should
277 extend to other LMICs. Second, we did not ascertain the effects of extending interview duration beyond
278 30 minutes, even though investigating demographic and health topics of interest might require such
279 lengthy interviews. We do not know whether there is an inflexion point, after which interviews become
280 too long, and participation and data quality decline more abruptly. We found no impact of interview
281 duration on data on non-mortality topics. However, we cannot exclude that the likelihood of answering

(accurately) the parental survival question is related to the content of the three versions of the questionnaire and not only to the duration of the interview. Third, the sample size of our trial might have been too limited to detect heterogeneity in the effects of interview duration and respondents' fatigue on MPS outcomes. Larger trials might be needed to investigate whether the effects of duration might vary between by age or gender of the respondents, interviewers, or their interaction. Finally, the impact of interview duration on participation and data quality might also depend on the level of mobile phone units provided to respondents who complete the interview. In our experiment, this amount was set relatively high and did not vary between study groups. Future studies should assess possible interactions between the provision of completion incentives, participation and data quality.

Despite these limitations, our study improves on the evidence available to constitute current guidelines, which primarily draws on insights from personal experience, informal feedback from interviewers and/or results of studies conducted in high-income countries. Importantly, the results of our trial suggest that current recommendations about the duration of MPS interviews are likely too restrictive. They might be revised to accommodate the possibility of longer interviews that include questions about a broader array of topics than have been investigated in MPS conducted in LMICs to date. In particular, questions about mortality at adult and older ages can be added to existing MPS without risking meaningful declines in participation, completion and data quality. This might greatly enhance our ability to monitor mortality in near real-time in LMICs with deficient civil registration systems.

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SUPPLEMENTAL MATERIAL

APPENDIX A

Random digit dialing

Study participants included mobile phone users aged 18–64 years old at the time of the study. Potential participants were recruited among users of Malawi's two major mobile networks through random digit dialling (RDD). We worked with Sample Solutions, a firm specializing in the provision of RDD samples. Sample Solutions first generated a list of phone numbers at random using Malawi's numbering scheme. They then matched this list to a global registry of authorised network subscribers, and excluded numbers that could not be located. Finally, a team of 5 interviewers contacted the selected numbers to introduce the study, assess the eligibility of potential participants who were reached, and ask for their consent to participate in interviews. Potential respondents were informed at the start of the call about the survey sponsors, i.e., the Malawi Epidemiology and Intervention Research Unit (MEIRU/KPS) and New York University Abu Dhabi (NYUAD). Specifically, the introductory statement used in all calls was:

> "*Hello, my name is and I work for the Malawi Epidemiology and Intervention Research Unit. I'm calling you because, together with researchers at New York University- Abu Dhabi, we are conducting a study on the impact of COVID-19 on several aspects of the lives of Malawians. Your mobile number has been selected by chance.*"

We implemented sampling quotas based on age, gender and regional residence. We formed sampling strata based on these characteristics, and enrolment continued in each stratum until the quota was filled or until progress towards this quota stopped. All interviews were conducted in local languages (Chichewa, Chitumbuka) or English, depending on mobile users' preferences. Mobile phone users who did not speak any of these languages were excluded from the trial. Mobile users who did not meet the age criterion and those whose sampling stratum was already filled were told that they were not eligible for the study.

Randomization and data collection

The randomization process was stratified by sampling stratum. It was conducted using random numbers generated in Stata 16.1. When initially placing a call to a selected mobile number, study interviewers were unaware of the mobile user's assignment to the 10-, 20- or 30-minute questionnaire. They remained unaware of that assignment until the user's sampling stratum had been determined and eligibility had been confirmed.

All data were collected on tablets using surveyCTO and relied on the software text audit program to monitor and record the time spent by interviewers on each specific surveyCTO screen (paradata). We recorded the time it took interviewers to administer each interview question. SurveyCTO also allowed determining how many minutes into the interview each question or questionnaire section first appeared.

Analytical choices

We conducted pre-specified intent-to-treat analyses. Therefore, all eligible randomized respondents were included in the analyses and we did not exclude respondents who took longer than their assigned interview duration to reply to the questionnaire. On average, preliminary procedures (i.e., screening, consent and debriefing) required about 5 minutes and 30 seconds to complete in all three surveys (median: 4 minutes 30 seconds). After consent, participants assigned the 10-minute interviews took about 10 minutes and 24 seconds (inter-quartile range (IQR)=8–12.49) to complete the questionnaire. About 14 minutes and 48 seconds (IQR=11.13–18.05) and 18 minutes and 16 seconds (IQR=14.07–22.55) were needed to complete the 20- and 30-minute interviews respectively.

As checks, we also examined data quality outcomes based on the actual duration of the interview with cut-offs of 10-min, 20-min, 30-min and 31+min. Expectedly, we found that respondents who took longer to respond to the questionnaires – regardless of their pre-specified length – produced more complete data on parental ages at death. However, we choose not to present these results since respondents who provided answers about parental deaths inevitably have longer survey durations, regardless of the questionnaire duration stated at consent.

APPENDIX B

Table B1. Questionnaire modules by stated interview duration

	10 min survey	*20 min survey*	*30 min survey*
Background questions			
Residence location, marital status, dwelling characteristics, schooling, places visited recently, internet and media use.	X	X	X
Recent economic activity and household welfare			
Paid work in past week, sector. Food consumption.	X	X	X
Health			
Self-reported physical and mental health, COVID-19 symptoms in the past month.	X	X	X
Recent use of medications			
Need and access to medications in the past month.		X	X
Knowledge and attitudes towards COVID-19			
Knowledge of transmission, treatment, and mask use.	X	X	X
Ever tested for COVID-19.	X	X	X
COVID-19 testing practices, recent infections.		X	X
Perceptions of COVID-19 spread in the country.		X	X
COVID-19 vaccination and stigma			
Vaccination status and attitudes towards vaccine.		X	X
Reasons for vaccine hesitancy.			X
Stigma towards people infected with COVID-19.			X
Behaviors and attitudes towards friends with COVID-19.			X
Friends' vaccination status, mask use.			X
Sibling survival			
Sibling vital status, age, location if alive. Age, month, and year of death if deceased between 2019-22.		X	X
Parental survival			
Mother and father's vital status, age, and location if alive. Age and year of death if deceased. Month of death and civil registration status if deceased between 2019-2022	X	X	X
Feelings during the interview			
Feeling upset by interview questions, extent of negative emotions.	X	X	X

Table B2. Characteristics of study participants by stated interview duration

	10 min survey	*20 min survey*	*30 min survey*	*Total*
Age group				
18-29	45.0% (377)	41.4% (336)	42.5% (356)	43.0% (1,069)
30-49	46.6% (390)	48.8% (396)	48.5% (406)	47.9% (1,192)
50-64	8.4% (70)	9.9% (80)	9.0% (75)	9.1% (225)
Sex				
Male	49.0% (410)	52.6% (427)	49.5% (414)	50.3% (1,251)
Female	51.0% (427)	47.4% (385)	50.5% (423)	49.7% (1,235)
Region				
Northern	25.1% (210)	25.6% (208)	24.7% (207)	25.1% (625)
Central	33.9% (284)	34.9% (284)	32.5% (272)	33.7% (840)
Southern	41.0% (343)	39.3% (320)	42.8% (358)	41.0% (1,021)
Residence type				
Urban	52.8% (442)	53.3% (433)	52.9% (443)	53.0% (1,318)
Rural	47.2% (395)	46.4% (377)	47.1% (394)	46.9% (1,166)
Missing	0.0% (0)	0.2% (2)	0.0% (0)	0.1% (2)
	837	812	837	2,486

Notes: Percentages are calculated within survey type. Values in brackets represent counts. The variables included in this table are extracted from the screening form, which was completed by all randomized participants.

Table B3. Distribution of survey results by stated interview duration

	10 min survey	*20 min survey*	*30 min survey*	*Total*
Consented and completed	805	769	787	2361
Refused at consent	25	27	28	80
Postponed/call back	3	1	2	6
Interview discontinued	4	15	20	39
Obs.	837	812	837	2486

Notes: "Postponed/call-back" refers to respondents who consented to be interviewed, indicated that they would prefer to be called back at a later time, and could not be reached again before the completion of the study. "Interview discontinued" refers to partial completion of the interview, i.e., when the mobile user consented to participate but did not reach the last set of questions in all study groups.

Table B4. Item non-response for non-mortality questions included in all three surveys

	10 min survey	*20 min survey*	*30 min survey*	*Total*	p-value
Recent economic activity and household welfare					
Aside from your own housework, did you work for at least an hour?					0.38
Missing/refused	0.1% (1)	0.0% (0)	0.0% (0)	0.0% (1)	
In the past 7 days, were you ever hungry but didn't eat because there wasn't enough money for food?					0.37
Missing/refused	0.0% (0)	0.0% (0)	0.1% (1)	0.0% (1)	
Health					
In general, how good or poor, if at all, would you say your mental health is?					0.37
Missing/refused	0.0% (0)	0.0% (0)	0.1% (1)	0.0% (1)	
In general, how good or poor, if at all, would you say your physical health is?					
Missing/refused	0.0% (0)	0.0% (0)	0.0% (0)	0.0% (0)	
Knowledge and attitudes towards COVID-19					
There is currently NO effective treatment for people who already have COVID-19?					0.38
Missing/refused	0.1% (1)	0.0% (0)	0.0% (0)	0.0% (1)	
Everyone with COVID-19 will become severely ill at some point?					0.38
Missing/refused	0.1% (1)	0.0% (0)	0.0% (0)	0.0% (1)	
The elderly are more likely to become severely ill from COVID-19?					0.055
Missing/refused	0.4% (3)	0.0% (0)	0.0% (0)	0.1% (3)	
Those who have other chronic conditions are more likely to become severely ill from COVID-19>					0.38
Missing/refused	0.1% (1)	0.0% (0)	0.0% (0)	0.0% (1)	
It is possible to have COVID-19 without showing any symptoms?					0.38
Missing/refused	0.1% (1)	0.0% (0)	0.0% (0)	0.0% (1)	
Children below age 12 are less likely to become severely ill from COVID-19?					0.38
Missing/refused	0.1% (1)	0.0% (0)	0.0% (0)	0.0% (1)	
In the last 7 days how often have you worn a face mask when you left your house?					0.38
Missing/refused	0.1% (1)	0.0% (0)	0.0% (0)	0.0% (1)	
Do you currently own a mask?					0.14
Missing/refused	0.2% (2)	0.0% (0)	0.0% (0)	0.1% (2)	
It is possible to get COVID-19 from drinking unfiltered water?					0.38

Missing/refused	0.1% (1)	0.0% (0)	0.0% (0)	0.0% (1)	
The virus that causes COVID-19 is spread from one human being to another through blood?					0.38
Missing/refused	0.1% (1)	0.0% (0)	0.0% (0)	0.0% (1)	
The virus that causes COVID-19 is spread through respiratory droplets?					0.37
Missing/refused	0.1% (1)	0.0% (0)	0.3% (2)	0.1% (3)	
It is possible to give the virus to someone else even if you don't show any symptoms yourself?					0.38
Missing/refused	0.1% (1)	0.0% (0)	0.0% (0)	0.0% (1)	
It is possible to get infected by touching an object or surface (e.g., table, door handle)?					0.38
Missing/refused	0.1% (1)	0.0% (0)	0.0% (0)	0.0% (1)	
Have you ever been tested for COVID-19?					0.19
Missing/refused	0.4% (3)	0.0% (0)	0.1% (1)	0.2% (4)	
Feelings during the interview					
Did any of the questions asked during the interview upset you?					0.61
Missing/refused	0.1% (1)	0.1% (1)	0.0% (0)	0.1% (2)	
Obs.	805	769	787	2,361	

Notes: Questions sorted (left-right) in order of appearance. Answer options for questions on physical and mental health were "very good", "good", "neither good or poor", "fairly poor" "very poor". Answer options for question on attitudes and knowledge about COVID-19 were "agree", "disagree" or "don't know".

Table B5. Age heaping and digit preferences by stated interview duration

	10 min survey	*20 min survey*	*30 min survey*	*Overall*
Mothers' current age				
Whipple Index	136.2	132.4	157.3	141.8
	[113.2–159.3]	[110.9–156.0]	[131.1–181.7]	[128.4–154.8]
Whipple60	184.4	179.7	142.9	169.0
	[152.5–215.8]	[147.2–211.8]	[117.2–171.9]	[151.7–187.2]
Fathers' current age				
Whipple Index	160.6	165.8	132.0	152.5
	[128.4–195.8]	[133.1–198.9]	[102.1–164.9]	[133.4.1–171.5]
Whipple60	175.4	177.4	179.9	177.5
	[143.6–207.7]	[145.4–209.9]	[149.2–211.7]	[158.6–195.8]
Mothers' age at death				
Whipple Index	142.2	154.2	137.5	144.4
	[100.5–185.2]	[110.6–196.9]	[109.9–178.4]	[120.1–168.7]
Whipple60	210.0	109.1	113.6	140.4
	[142.9–285.7]	[105.8–140.3]	[102.9–164.0]	[108.2–172.5]
Fathers' age at death				
Whipple Index	157.1	168.9	157.4	160.9
	[123.9–191.0]	[133.1–209.2]	[120.3–194.8]	[138.3–181.4]
Whipple60	162.3	162.5	113.8	145.7
	[118.6–204.2]	[123.3–207.9]	[107.8–152.9]	[121.9–168.1]

Notes: The standard Whipple Index is calculated for the ages 23–62 (inclusive). The Whipple60 for ages 60+. 95% confidence intervals calculated using bootstrap methods (2.5th and 97.5th percentile) are in square brackets.

Figure B1. Flow chart of study participation

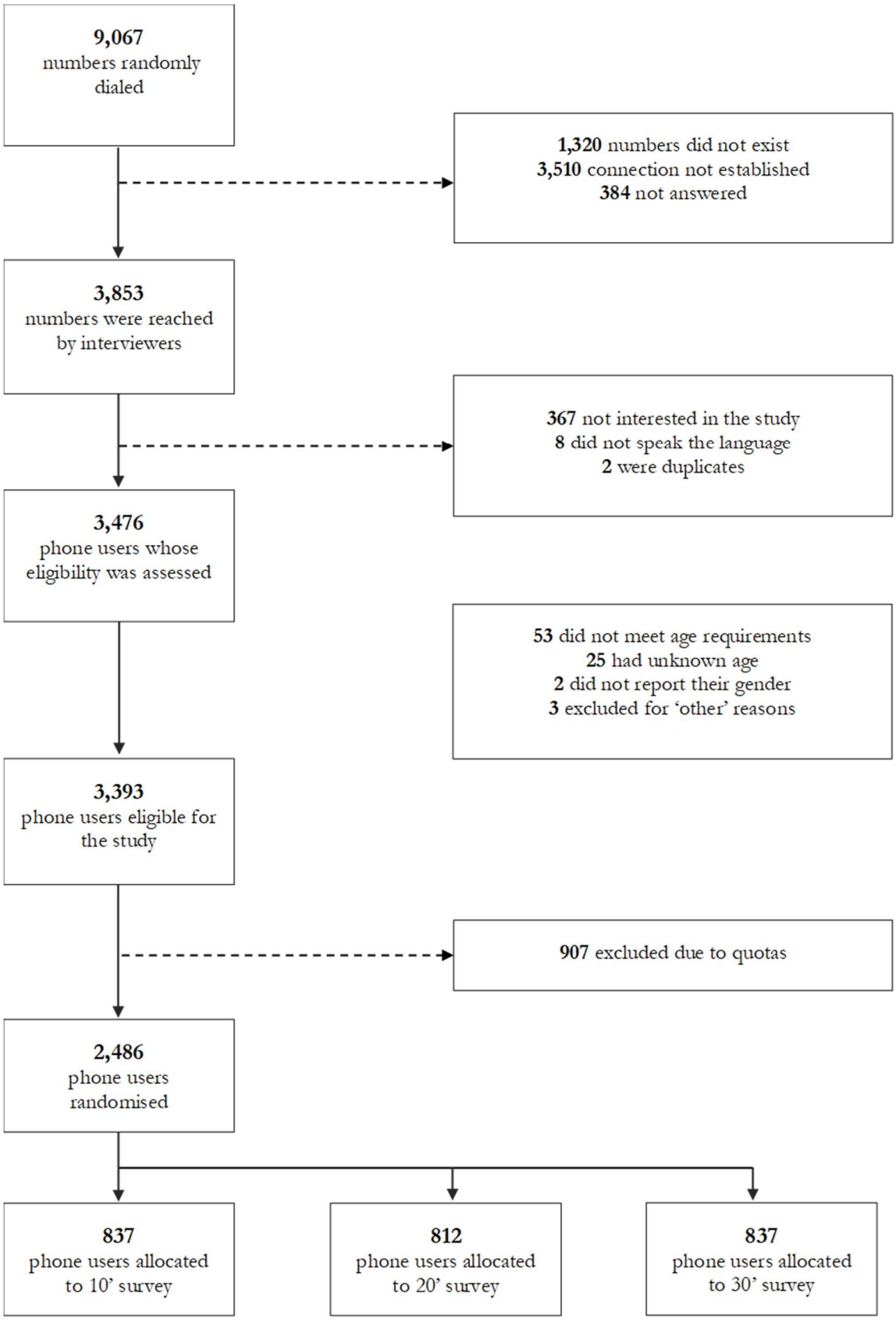


Figure B2. Time from consent to questions on mother's survival by stated interview duration

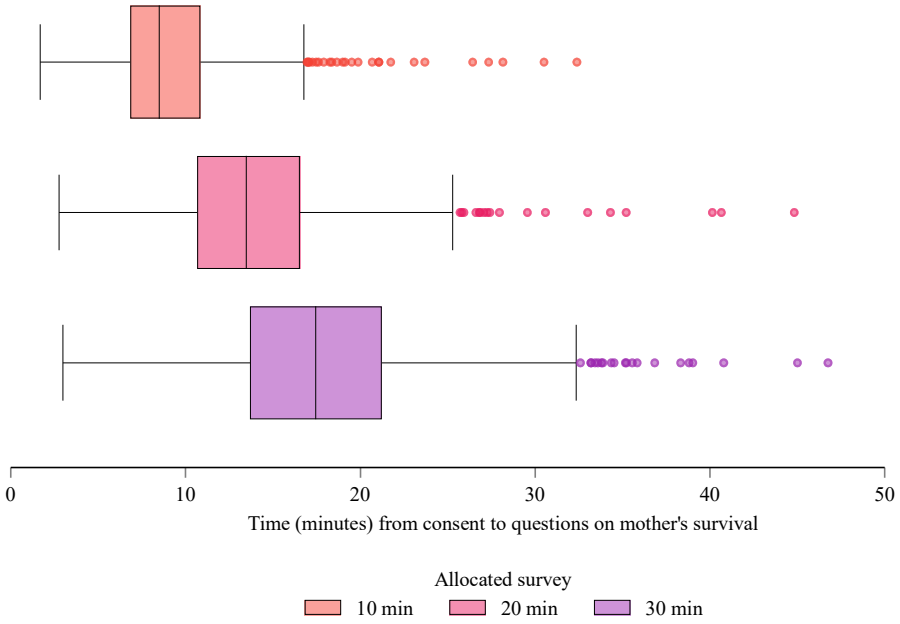
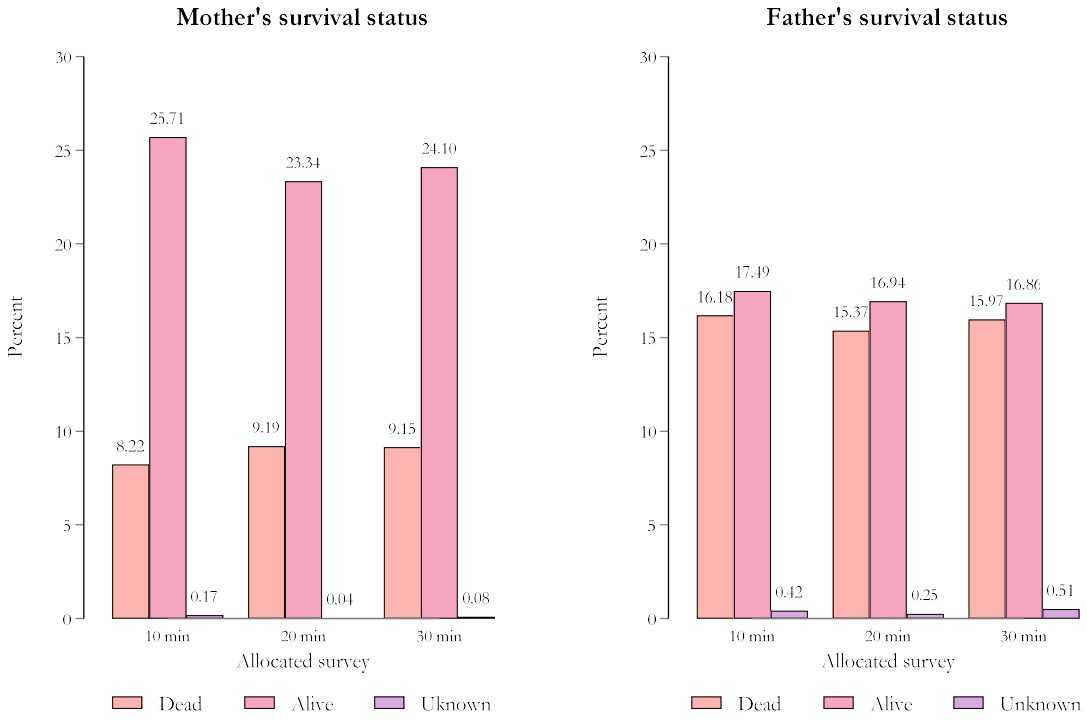
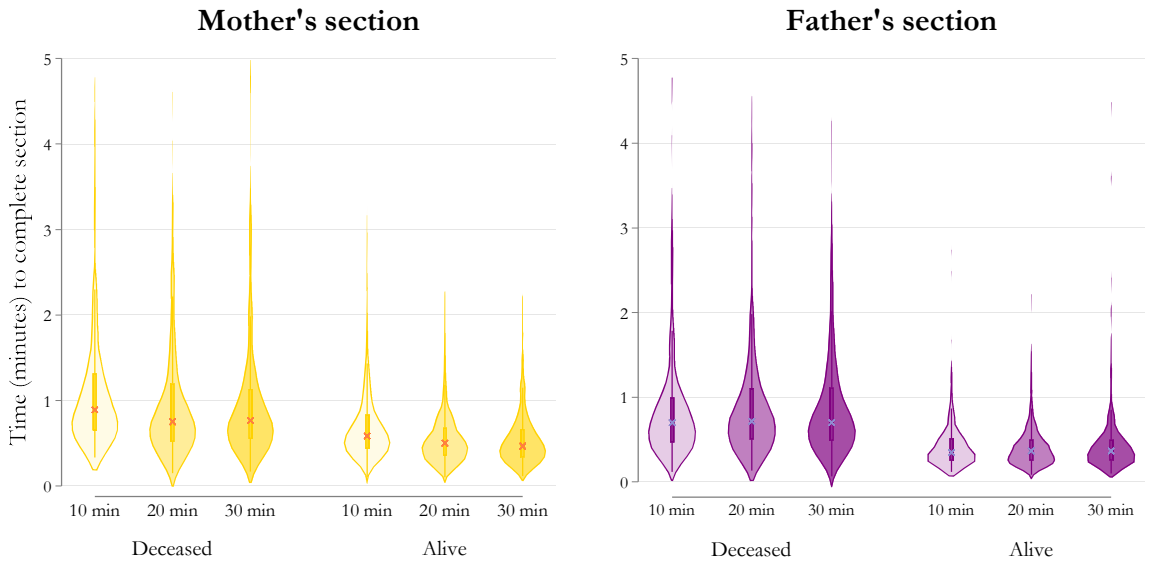


Figure B3. Parental vital status by stated interview duration



Note: Cell percentages.

Figure B4. Time needed to complete parent–specific sections by stated interview duration and parent vital status



Note: Respondents who did not know about the survival of their mother (n=7) or father (n=28) are excluded.